

REMARKS

I. PENDING CLAIMS AND SUPPORT FOR AMENDMENTS

Upon entry of this amendment, claims 1, and 3-16 will be pending in this application. Applicants have amended claim 1 to recite the presence of activated carbon particles, and to clarify that the binder binds the activated carbon particles together, and that the metal oxide nanocrystals are dispersed in the binder. Support for these amendments can be found, inter alia, in original claim 2, and in the specification at page 5 and in the examples. Applicant has also added new claim 16, which recites that the filtration media is in the form of a porous block. Support for this claim can be found in the specification at page 4, lines 13-15 and original claim 9.

No new matter has been added.

II. ANTICIPATION REJECTION OVER AMARASINGHE ET AL.

At page 2 of the Office action, the Examiner has rejected claim 1 under 35 U.S.C. § 102(e) over Amarasinghe et al. (U.S. Patent No. 6,355,166). Applicants respectfully traverse this rejection and request reconsideration and withdrawal thereof.

The Examiner points to column 25, lines 27-28 of Amarasinghe et al., which relates to a magnetic microbead having a core of $\gamma\text{-Fe}_2\text{O}_3$ and surrounded by a polymer coating. These encapsulated particles are then used to modify the electrode surfaces of fuel cells.

Applicant is claiming a filtration media containing nanocrystals dispersed in a polymer binder, not coated nanocrystalline beads. Accordingly, Amarasinghe et al. does not anticipate Applicant's claims, and the rejection should be withdrawn.

III. OBVIOUSNESS REJECTION OVER AMARASINGHE ET AL.

At page 3 of the Office action, the Examiner has rejected claims 3 and 6 as obvious under 35 U.S.C. § 103(a) over Amarasinghe et al. Applicant respectfully traverses this rejection and requests reconsideration and withdrawal thereof.

The Examiner has taken the position that the concentration of nanocrystalline particles and their average particle size does not patentably distinguish claims 3 and 6 from the disclosure of Amarasinghe et al. As explained above, Amarasinghe et al. does not teach or suggest the invention recited in claim 1. Moreover, for the Examiner's reasoning to hold, Amarasinghe et al. would have to disclose some range for particle size and concentration. The portion of Amarasinghe et al. cited by the Examiner is completely silent with respect to both. As a result, Amarasinghe et al. does not recognize particle size or particle concentration as result-effective operating parameters. Thus, it could not have been obvious to one of ordinary skill in the art to optimize either of these parameters.

Since the Examiner has failed to establish a *prima facie* case of obviousness for at least the reasons listed above, the rejection should be withdrawn.

IV. OBVIOUSNESS REJECTION OVER LISENKO AND AMARASINGHE ET AL.

At pages 3-4 of the Office action, the Examiner has rejected claims 1-4 and 6-15 as obvious under 35 U.S.C. § 103(a) over Lisenko (U.S. Patent No. 5,639,550) in view of Amarasinghe et al. Applicant respectfully traverses this rejection and requests reconsideration and withdrawal thereof.

Lisenko discloses a composite particulate system that, in effect coats larger particles with smaller particles. The smaller particles are glued in place on the surface of the larger particle by a binder. See column 2, lines 2-11. However, the result is a granular, particulate material. As illustrated in Figure 2 of Lisenko, the smaller particles are not dispersed in the binder. Instead, the binder forms an adhesive layer between the smaller particles and the surface of the larger particles. Moreover, as is clear from the disclosure that the Lisenko material is particulate, the binder does not adhere the larger particles to each other to form any kind of larger structure. As explained at column 2, line 66 to column 3, line 18, the material prepared by Lisenko is analogous to that prepared by spray drying, but with better attrition resistance.

A worker of ordinary skill in this art would not have been motivated to combine the teachings of Lisenko with those of Amarasinghe et al. The Examiner alleges that such motivation comes from the desire to more thoroughly and evenly disperse the titanium oxide material of Lisenko throughout the composite material. This reasoning is problematic in a number of respects.

First, these references are from widely different art areas. Lisenko is directed to providing particulate ion exchange materials, while Amarasinghe et al. is directed to providing magnetic materials for fuel cells. The Examiner has not explained why a worker of ordinary skill in the ion exchange material art would look to art relating to fuel cells for anything.

Second, the references are not directed to solving anywhere near the same type of problem. Amarasinghe et al. is to stack coated microbeads on an electrode surface.

Even though coated, the magnetic properties of the microbeads remain usable.

Lisenko, by contrast, is concerned with adhering small particles to the surface of a larger particle. However, in order for these small particles to function in the manner disclosed by Lisenko, their surfaces must be uncoated (so that the fluid to be purified/exchanged can contact the particle surface). See Lysenko, at column 3, lines 28-34:

The primary material [the small particles] of the present invention is preferably a material having a property desired in the final composite such as ion exchange capacity with a particular undesirable component or constituent of a medium to be treated with the composite particulate material.

Although Lisenko uses the term “preferably” in this context, no other function for the primary material is disclosed therein, and the need for the primary material to have an exposed surface is reasonably extended to the full scope of Lisenko’s disclosure. As a result, combining the reference teachings in the manner suggested by the Examiner would effectively destroy the utility of Lisenko, since the dispersed nanocrystals would be completely coated with binder.

Third, there is no suggestion in either reference that iron oxide and titanium oxide are interchangeable or equivalent. Lisenko does not list iron oxide as a potential primary material, or ascribe any ion exchange properties to it. Instead, Lisenko references titanium hydroxides and silicates. Amarasinghe et al. do not contemplate titanium oxides for use in electrode coatings.

Even if the reference teachings were combined in the manner suggested by the Examiner, the claimed invention would not be obtained. Combining the reference

teachings of Amarasinghe et al. with those of Lisenko would result in adhering particles (whether titanium oxides or iron oxides is irrelevant) that are composites of metal oxide encapsulated with binder to the carrier particle. This is not the invention claimed in this application. The claims recite that the metal oxide nanocrystals are dispersed in the binder (not individual encapsulated particles) and that the binder adheres the activated carbon particles to each other.

For at least the reasons given above, the Examiner has failed to establish a prima facie case of obviousness, and the rejection should be withdrawn.

V. OBVIOUSNESS REJECTION OVER LISENKO, AMARASINGHE ET AL., AND SUGIMOTO

At pages 4-5 of the Office action, the Examiner has rejected claim 5 as obvious under 35 U.S.C. § 103(a) over Lisenko and Amarasinghe et al., as applied to claims 1-4 and 6-15, and further in view of Sugimoto (U.S. Patent No. 5,989,420). Applicant respectfully traverses this rejection, and requests reconsideration and withdrawal thereof.

The Examiner relies on Sugimoto to teach the use of zirconia in combination with titanium oxide in composite filtration materials. Applicant respectfully submits that the Examiner has failed to establish a prima facie case of obviousness for the following reasons.

First, Sugimoto does not cure the deficiencies of Lisenko and Amarasinghe et al. described above. Sugimoto is directed to a porous ceramic filter and does not teach or suggest dispersing nanoparticulate metal oxides in a polymeric binder, or using that binder to bind together particles of activated carbon. Thus, even if the

references were combined in the manner suggested by the Examiner, the claimed invention would not be obtained.

Second, the art area from which Sugimoto is drawn is very different from that of Amarasinghe et al. and from that of Lisenko. One of ordinary skill in the art of making fuel cell electrodes, or in the art of making particulate carbon compositions, would not have looked to the art of ceramic filters for teachings about which metal oxides to use. There is not suggestion in any of the cited references that zirconia could be desirably incorporated into either a fuel cell electrode by coating a zirconia nanoparticle with polymer and forming stacks thereof on an electrode surface, or onto the surface of a carbon particle to act as a particulate purification material.

Moreover, even if the reference teachings were combined in the matter suggested by the Examiner, the claimed invention would not be obtained. Even combining the teachings of Sugimoto with those of Amarasinghe et al. and Lisenko would not result in the claimed invention. As described in Applicant's specification, the filtration media of the invention is an activated carbon containing block that is obtained from a compression process. The entire point of Sugimoto is to avoid such compression by using an ultrasonic vibrator. Thus, even if Sugimoto were combined with the other references, the result would not be a filtration media according to the invention, but rather a very high pressure drop material, without any activated carbon, that has been ultrasonically welded together.

VI. THE CITATION OF VANDERBILT ET AL.

At page 5 of the Office action, the Examiner cites Vanderbilt et al. (U.S. Patent No. 4,753,728), but does not rely upon this patent in any rejection. Applicant's

agree that no such rejection is appropriate over Vanderbilt et al., which has nothing whatever to do with Applicant's claimed invention.

Applicant respectfully submits that the claims are in condition for immediate allowance, and an early notification thereof is earnestly solicited. If the Examiner has any questions, or if further issues remain to be resolved, the Examiner is respectfully requested to contact the undersigned at 404.815.6218 prior to issuance of any final Office action.

The Commissioner is hereby authorized to charge any deficiencies or credit any overpayment to Deposit Order Account No. 11-0855.

Respectfully submitted,


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MARKED UP COPY OF AMENDED CLAIMS

1. (Amended) A filtration media for drinking water, comprising:

metal oxide nanocrystals; [and]

particles of activated carbon; and

a polymeric binder

wherein the polymeric binder is present in sufficient amount to adhere the activated carbon particles to each other, and wherein the metal oxide nanocrystals are dispersed in the polymeric binder.